Department of Mechanical Engineering Research Seminar Series
Friday September 8, 2017. 2.00-2.50 pm, Kitson 309

Recent Advances in Measured Data Expansion for Full-Field Dynamic Response and Dynamic Strain for Linear and Non-Linear Systems

(and additional applications and some other cool stuff going on in the SDASL Lab)

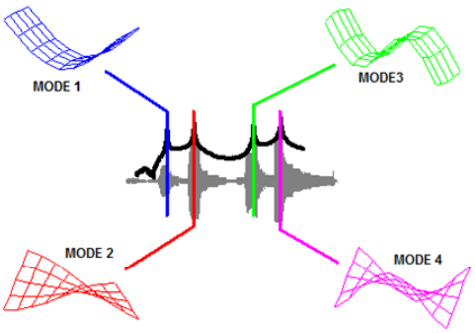
SUMMARY:

Dynamic response due to operating and occasional loads is an important consideration in the design of structural systems. Fatigue and life usage are of great importance for structural health monitoring. However, in the design of many structural systems, the actual loading and structural condition (boundary condition, environmental condition, etc.) are not readily known or easily determined. These are critical pieces of information necessary for the design of any structural system.

Much effort has been expended by many researchers in attempting to identify these loading scenarios. At best, the forces and actual boundary conditions are approximate and have an effect on the overall predicted response and resulting stress-strain that is identified for subsequent evaluation. In addition, the operating system is generally only measured with a very sparse array of transducers to identify the actual loading conditions.

Recently several new approaches have been developed that allow for limited sets of measured data, in conjunction with a finite element model, to be used for prediction of full-field response. The limited sets of measurements are used with a unique expansion algorithm to obtain this full field information. The finite element model mass and stiffness matrices are used to obtain the normal constitutive relations as well as the modal characteristics. The technique is extended to linear components interconnected with nonlinear connection elements to also predict full-field dynamic response and dynamic strain.

The techniques presented are currently being extended for force estimation and damage detection applications. Also some new measurement applications are presented along with a few of the recent snapshots of ongoing research work in the SDASL Lab.



Sincerely,

Dr. Peter Avitabile
Professor Emeritus, Mechanical Engineering
Structural Dynamics and Acoustics Systems Laboratory
University of Massachusetts Lowell
One University Avenue
Lowell, Massachusetts 01854
peter_avitabile@uml.edu
www.uml.edu/SDASL
978-934-3176

Pete Avitabile

Contact Information:
Dr. Peter Avitabile, PE
Professor Emeritus
Mechanical Engineering
Structural Dynamics
and Acoustic Systems Laboratory
University of Massachusetts Lowell
1 University Avenue
Lowell, Massachusetts 01854
Phone: 978-934-3176
peter_avitabile@uml.edu
http://www.uml.edu/SDASL

B.S.M.E., Manhattan College
M.S.M.E., University of Rhode Island
D. Eng., University of Massachusetts Lowell
Professional Engineer, Rhode Island

Professor Emeritus, Mechanical Engineering
University of Massachusetts Lowell

Co-Director, Structural Dynamics and Acoustic Systems Laboratory
Director, Modal Analysis and Controls Laboratory

President Society for Experimental Mechanics 2016
Associate Editor – Handbook of Experimental Structural Mechanics

The Structural Dynamics and Acoustic Systems Laboratory (SDASL) focuses on research related to analytical and experimental problems in the areas of structural and acoustic systems. The main thrust of the SDASL is to develop, employ and improve techniques to solve these problems using analytical approaches that are verified through experimental techniques.

Over 4 decades experience in design, analysis, finite element modeling and experimental modal and structural dynamic testing. Main area of research is structural dynamics specializing in the areas of modeling, testing and correlation of analytical and experimental models and integration of analytical and experimental techniques. Research, testing and consulting performed for automotive, aerospace, defense and computer/consumer related areas. Written over 200 technical papers and given numerous seminars in the areas of experimental modal analysis, structural dynamics, vibration fixture design, and modeling and correlation.